NORTHEASTERN FOREST EXPERIMENT STATION

Division of Watershed Management Research

Semi-annual Report April 1958

GENERAL

The big picture this winter was pretty well obscured by snowfalls which were frequent and wet; one observer even reported snowflake-splash.

Between storms:

1. Norman Tripp and Howard Lull collaborated on two papers, one for the SAF meeting and one at the request of the New England Water Works Association.

2. A survey of municipal watersheds in the Northeast was completed: turned out there are about 400 with a forest area of about 1 million acres. A series of three papers on municipal forest watersheds was prepared for the Journal of the American Water Works Association.

3. A 30-page paper on forest management in a watershed management program was prepared as background material for an FAO handbook.

4. Si Little's Coastal Oak-Pine Research Center came up with a watershed research project--the City of Newark agreeing to establish 3 small experimental watersheds on the city-owned 30,000 acre Pequannock watershed.

KINGSTON RESEARCH CENTER

Leading Ridge Watershed

Road location and weir sites for watersheds 2 and 3 at State College, Pa. were selected and road construction will begin as soon as weather permits. This cooperative watershed management research project will be dedicated at the summer meeting of the Pennsylvania Forestry Association to be held at State College.

Snow in the Poconos

When we began our watershed management research in the Poconos in 1948, we were informed that snow was an important climatic factor. Thus, a part of our research program was based on snow management--the possibilities of encouraging deeper accumulations and prolonging the melt period. This is the first year that snow cover was not intermittent or relatively unimportant. Perhaps such a snow accumulation occurs in 10-year cycles and the local folks just remembered the last heavy snow.

Snow depths at the Pocono Experimental Forest were up to 48 inches several times during the winter. The most recent measurement on April 9 showed an average water content of 10.69 inches for the snow course.

Soil Moisture Study

Analysis of the data collected last summer at Dilldown has been completed. It indicates that there are significant differences in the amounts of water held in the soil during the growing season under different vegetative covers. A control plot, with a mixture of scrub oak and ground cover, consistently had the lowest soil moisture at all the depths sampled. A ground cover plot had the next lowest soil moisture. The difference between this plot and the preceding one, caused by scrub oak, was insignificant. Plots on which all the vegetation was deadened consistently showed the highest soil moisture. A scalped plot was extremely variable but generally maintained an intermediate position.

Soil Survey

Plans are being made for a detailed soil survey of the Pocono Experimental Forest this summer. Cooperation has been promised by the local S.C.S. men, and a work plan is being prepared.

Watershed Calibration

Reigner has been churning out numbers in order to have the finished product to present to the American Geophysical Union meeting early in May.

The last development was the production of a curve to adjust precipitation data by size of storm. Part of every storm leaves the watershed as storm runoff and has no effect on storage. This relationship is curvilinear, that is, a disproportionate amount of a large storm runs off directly. As an example, a 9 inch storm in July 1952 yielded 2.78 inches of storm runoff; but a 3 inch storm under the same antecedent conditions would yield only 0.30 inch of storm runoff.

As we are interested in storage estimates, our precipitation data had to be adjusted to allow for storm size.

Miscellaneous

Reigner and Eschner with Lull and Storey paid a visit to the Baltimore city watersheds where a new cooperative watershed management study is being set up. Concrete block stilling basins are being constructed by the watershed supervisor.

MOUNTAIN STATE RESEARCH CENTER

Snow on the Fernow

This winter an unusually deep snow pack has blocked roads into the Fernow and the Clover Run watersheds for days on end. Making our weekly precipitation observations, and changing charts has necessitated snowshoeing long distances (and Ken Reinhart even tried out his skis--no comments!). It may be some consolation to the men at Hubbard Brook to know we have broken trail on snowshoes for 10 miles stretches this winter, changed charts at 11° F below, and chopped 4 to 6 inches of ice from around the weir blade. Highlight of this winter's misery was Reinhart's tumble into a four-foot deep weir basin on a zero degree day (after he chopped the ice out). Burley Fridley pulled him out, and he skied two miles down to the car in a suit of mail. Not so discriminating as Sid Weitzman who fell in Weir #2 (and had to be rescued against his will), Ken fell in one of the Clover Run weirs that runs just cheap, old, pure, pipe-rusting water.

Soil Moisture Measurement

We hope to use our nuclear moisture meter (procured from Johnson and Associates), for soil moisture sampling this summer. There are many drawbacks to its use in the forest but the advantages of in situ volumetric measurements seemingly outweigh them. Driving the aluminum access tubes into the rocky Fernow soils is one of the main drawbacks. Another is the change in calibration during use, caused by battery drain. We hope to overcome this by obtaining a larger wet battery than we now use. Another problem is that the meter is heavy and bulky to carry up some of the steeper slopes.

More Water Quality Data

In cooperation with the Bureau of Sport Fish and Wildlife, we are adapting our water quality measurements to determine effects of cutting practices upon fish habitat. In addition to measurements of turbidity, we are now determining pH, temperature, alkalinity, and total CO_2. pH may be a very important factor in fish environment.

Some preliminary results are already coming from our clear-cut watershed. Suspended sediments on the clear-cut range up to about 50,000 ppm; turbidities by ocular measurement run between 50 and 5000 units. This compares with suspended sediments of 10 ppm for the control watershed. We have finished bulldozing skid roads in the other 3 watersheds to be cut later. No logging has yet been done and the roads show no compaction or erosion. Turbidities of the runoff have not increased since road building; they still run under 5 units on the Jackson turbiditimeter. This picture may change when we get more rain.

Surveys and Computations

Boundary surveys of the two new Wilson Hollow watersheds (forested) were recently completed. The acreages were 55.2 and 55.9. Surveying is about finished on the two abandoned-farmland watersheds on Clover Run.

Watershed computations on the five original watersheds are being kept as near up-to-date as possible in anticipation of the end of the first year of treatment on our clear-cut watershed--May 1. There are about five weeks of logging left to clearcut this watershed.

Thanks, Fellows

The Northeastern Station, through the Washington office, recently requested from all Stations material on weir construction that would be helpful to Pierce and Reinhart for their proposed paper on the subject. The response was gratifying and we wish to express our thanks to all who responded. With this help, the authors hope to put out a paper which will be of value to those faced with weir construction problems.

WHITE PINE-HARDWOOD RESEARCH CENTER

Snow at Hubbard Brook

Weather has been very much in the news all over the East this year. In some parts of the White Mountains record snowpacks blanket the ground. Laconia has been buried under the deepest snow for some years. But, surprisingly, the snowpack on the Hubbard Brook Experimental Forest is no greater than it was two years ago; and that was not an unusual year. Our present water content is about 9 inches. Of course, it's snowing now (March 21) and spring could still be a month away in the hinterlands.

Our weasel--Cargo Carrier, Amphibious, M29C, by army jargon--arrived about three weeks ago from army surplus in California. Except for corrosion on some of the splash panels and a broken windshield, it is in excellent condition. We have used it already. We had no trouble climbing a 20 percent grade with about three feet of snow on the ground. It left a track impression about 5 inches deep. Beats snow shoeing any day!

Integrated Plot Study

We are not entirely pleased with this title but for want of a better one it has stuck. As mentioned in a previous quarterly report this study is an intensive investigation of a large number of factors involved in the hydrologic cycle, e.g., soil moisture and temperature, weather, vegetative cover, etc. on three differently treated plots.

Sartz turned in a 48-page working plan on the frost and snow phases, the heaviest piece of work that has come off the Center's typewriters since Trimble had all hands knee-deep in his problem analysis. The plan describes

in detail how we will determine differences in the frost and snow patterns on three hardwood forest plots both before treatment and after cutting two of them by different methods. The study was actually started last fall. So we already have our first year's data.

As part of this integrated study we would also like to determine the effects of treatment on soil moisture. But in order to determine them we must first be able to measure soil moisture effectively. The techniques for doing this on our kind of soils do not exist at the moment. We will try to develop some this summer. As of now we lean heavily toward one of the neutron-scattering devices.

In the meantime, and also on the integrated plots, we are planning an interception study to give us a net rainfall figure for soil moisture analysis. Leonard is preparing the working plan. It calls for measurements of both throughfall and stemflow. While a good bit of interception work has been done through the years, many of the results are contradictory; and none of them could be applied directly to our plots.

Weirs, Road, and Laboratory

Weir No. 3, our latest, was set in operation at the beginning of the dormant season. The use of a removable trough which does not interfere with the free-fall of water below the notch has enabled us to obtain rather precise calibration curves.

Using the suggestion of the California Station we have placed peak-roof shaped hoods over the notches in hopes these will lessen the ice build-up at the blade during extreme cold temperatures. So far they seem to have helped but a modification in their design may be tried to increase their efficiency.

Bob Pierce and the engineering staff of the White Mountain National Forest are writing construction specifications for our next two weirs and will place these for bid by private contractors. If the bids are not exorbitant and a reliable and skilled contractor is secured, contracting the weirs should free our technical staff to undertake summer duties we normally have been unable to pursue.

Much to our pleasure the second section of road into the watershed is nearing completion. This next piece will extend the road to almost 4 miles--in close proximity to the main brook. From here on it looks like road construction may keep ahead of our weir developments.

Plans have been laid for a Soils and Biological Laboratory in the basement of the Forest Service Building in Laconia. The White Mountain National Forest has graciously given up approximately 870 square feet of their storage space to permit the establishment of this much-needed lab. If sufficient funds are available the space will be converted to a large general purpose laboratory for use in soils, pathology, and physiology investigations. A small portion of the space will be partitioned into 4 rooms for specialized activities.

Compilation

We have finished revising our compilation procedures for climatic and streamflow data. Some of the old, standard precipitation and runoff forms were revised, and a few new ones added. The result is a simpler compiling system and a much smaller accumulation of paper per year. The new system has been written up and assembled as an instruction manual.

Soil Moisture Measurement Discussion

We were very happy to see the discussions on soil moisture measuring by John Hewlett and the Piedmont Research Center (Lou Metz?) in the last semi-annual report. We are currently wrestling with the same problems, albeit only at the feet-on-desk stage thus far. If soil moisture sampling by the usual methods requires a close look in the residual soils of the South, it most certainly requires a closer one here in the mountains of New Hampshire.

Besides the usual roots, rodent burrows, and insect tunnels, we have crazy, mixed-up glacial till soils. We have all manner and sizes of sand, gravel, and boulders--alone or in mixture. We have 6 inches of humus and we have no humus--2 feet apart. We have buried profiles and we have humps and hollows--the result of windthrow through the years. This is the natural landscape. It is a soil sampler's nightmare.

So we still have our feet on our desks. We haven't yet given up the idea of using Colman units--if only to track soil moisture movement to various depths after various amounts of rain. We think, though, that a neutron scatterer or some similar device offers the only real solution. With our bouldery soils we would still have some problems. We would have to sample very intensively because of extreme variability. But once the tubes were in the ground we could get by with one small boy to carry the rig instead of our whole staff armed with sampling cans and driving hammers. And we would be getting useable data. As I see it, the only big problem would be to convince the natives that we are really not prospecting for uranium.

PUBLICATIONS

Influence of land use on time of soil freezing and thawing in the Northeast. Richard S. Sartz. Jour. Forestry 55: 716-718. 1957.

What they said about forests and floods in Pennsylvania 50 to 75 years ago. Howard W. Lull. Pa. Forests 37: 91-92, 107. 1957.

Forest soil-moisture relations in the coastal plain sands of southern New Jersey. Howard W. Lull and John H. Axley. Forest Sci. 4: 2-19. 1958.

How type of soil frost affects infiltration. George R. Trimble, Jr., Richard S. Sartz, and Robert S. Pierce. Jour. Soil and Water Conserv. 13: 81-82. 1958.

Manuscripts submitted:

Forest and water management on reservoir properties and municipal watersheds in the Northeast. Howard W. Lull.

Municipal watersheds in the Northeast. Howard W. Lull.

Logging roads on municipal watersheds. G. R. Trimble, Jr.

Management problems and opportunities on forested watersheds in the Northeast. Norman R. Tripp and Howard W. Lull.

Forest watershed management in New England. Howard W. Lull and Norman R. Tripp.